NAME:_____ DATE:_____
CLASS:_____
MY NASA DATA: March of the Polar bears: Global Change, Sea Ice, and Wild Life Migration
http://mynasadata.larc.nasa.gov/?page_id=474?&passid=90

March of the Polar Bears: Global Change, Sea Ice, and Wildlife Migration

Purpose: Students will use NASA satellite data to study temperature and snow-ice coverage in the South Beaufort Sea, Alaska. The data can be used to correlate with USGS ground tracking of polar bears, and to relate this to global change, sea ice changes, and polar bear migration. The data can be used to draw conclusions surrounding any migration patterns in the region.


photo by USGS

Grade Level: 7 – 12

Estimated Time for Completing Activity: Two 50-minute class periods
Learning Outcomes:

- Students will analyze maps and time series data to understand changes.
- Students will construct data-based explanations and conclusions.
- Students will better understand global change through a local case study.
- Students will consider the impact of environmental changes on wildlife.
- Students will consider the impact of human activities on life and the Earth.

Prerequisite
- Familiarity with locating places on maps using latitude and longitude
- Familiarity with understanding color palettes on maps and reading line plots

Tools
- Computer with Internet Access
- Color printer (optional)

National Standards:
Geography: Environment and Society
Geography: Places and Regions
Math: Data Analysis and Probability

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Science Content: D Earth and Space Science
Science Content: C Life Science

AP Environmental Science Topics
Atmosphere-ocean interactions
Climate shifts
Endangered species
Greenhouse gases and the greenhouse effect
Impacts and consequences of global warming
Maintenance of biodiversity through conservation
Ocean circulation
Reducing climate change
Species movement

Virginia Standards of Learning:
ES.1c: The student will plan and conduct investigations in which scales, diagrams, maps, charts, graphs, tables, and profiles are constructed and interpreted.
ES.2a: The student will demonstrate scientific reasoning and logic by analyzing how science explains and predicts the interactions and dynamics of complex Earth systems.
LS.12: The student will investigate and understand the relationships between ecosystem dynamics and human activity.

Vocabulary:
climate
global warming
greenhouse effect
latitude
longitude
temperature
trend

Lesson Links:
Polar Bear Background Information (WWF)
Polar Bear Catching, Tagging, and Tracking Animation (WWF)
Polar Bear Migration – Sea Ice Change Animation (USGS)
Live Access Server
NASA Global Climate Change website
Polar Bears International website
Global Warming and Polar Bears

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Background:

The polar regions of the Earth (Arctic and Antarctic) have some of the most extreme climates on Earth, with temperatures usually well below freezing all year. The Arctic polar region is mainly sea ice floating upon the Arctic Ocean, whereas the Antarctic region is a continent with permafrost, glaciers and surrounding sea ice.

Scientists expect and are observing that global warming due to the increase of greenhouse gases will first impact the polar regions and the expanse of sea ice. Even a few degrees increase in temperatures will cause sea ice to break away and float into warmer waters, or to melt in place. The melting of polar sea ice will not only prompt climate and weather changes, but will also impact the ecosystem in the Arctic.

Local impacts are already being seen in the study of the polar bear habitat, diet and migration patterns. In this lesson, you will explore the changes in temperature and sea ice coverage in the South Beaufort Sea, north of Alaska. You will then consider how the changes you observe in the data may affect the migration of polar bears in the region.

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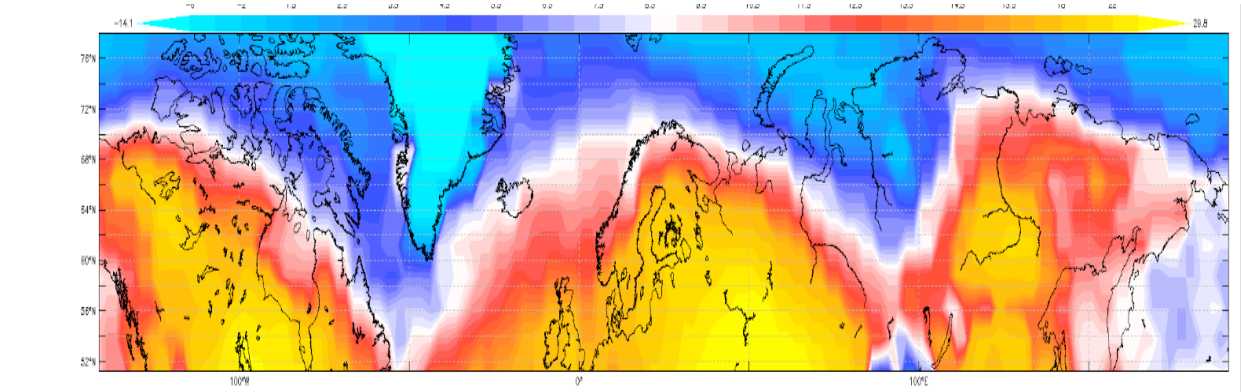
Procedure:

Background Activity: Examine the first three Lesson Links to learn about polar bears, their habitat and migration patterns. Discuss as a class what you have learned about polar bears and the Arctic climate.

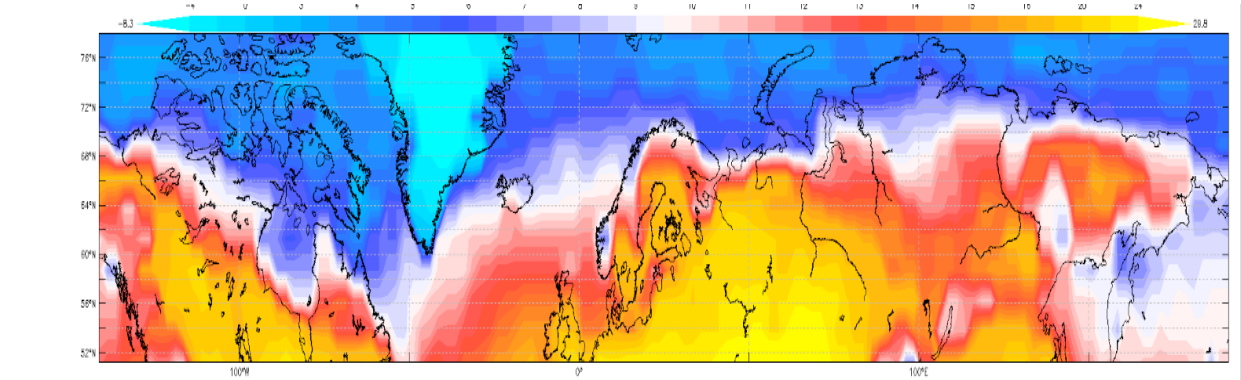
Data-analysis Activity: Using the Live Access Server lesson link, you will construct six pieces of data to help you analyze trends in the Arctic.

Use the following 3 plots to answer questions 1 – 4 below. These plots are for Walnut Grove, Minnesota, site of one of the Little House on the Prairie books.

Maps Part 1 – Monthly Near Surface Air Temperature Color Plot for June 1995
Temp range on key -4 C (light blue) to 24C (yellow)



Maps Part 1 – Monthly Near Surface Air Temperature Color Plot for June 2005
Temp range on key -4 C (light blue) to 24C (yellow)



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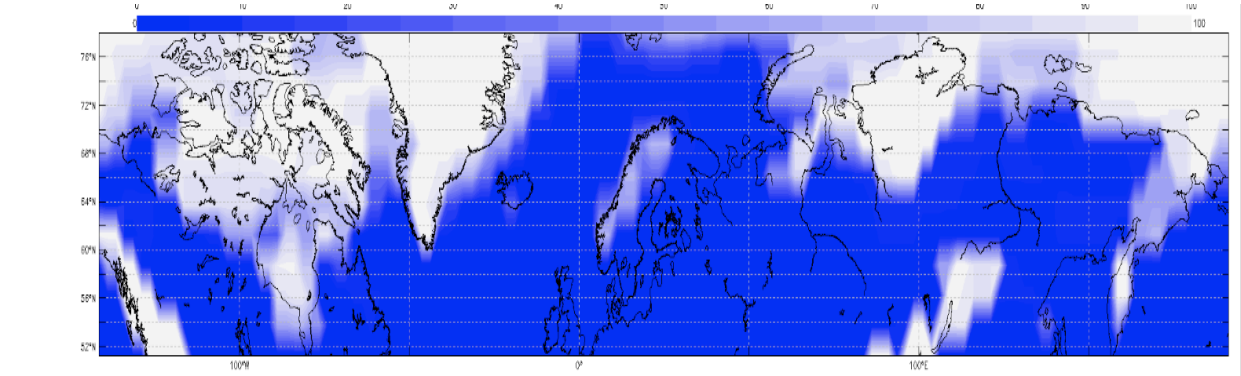
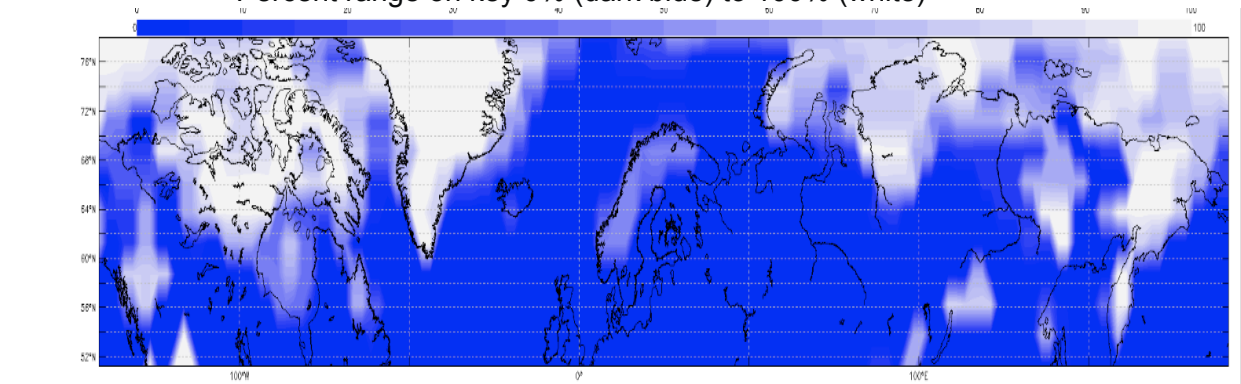
Maps Part 1 – Monthly Snow-Ice Percent Coverage for June 1995

Percent range on key 0% (dark blue) to 100% (white)



Maps Part 1 – Monthly Near Surface Air Temperature Color Plot for June 2005

Percent range on key 0% (dark blue) to 100% (white)



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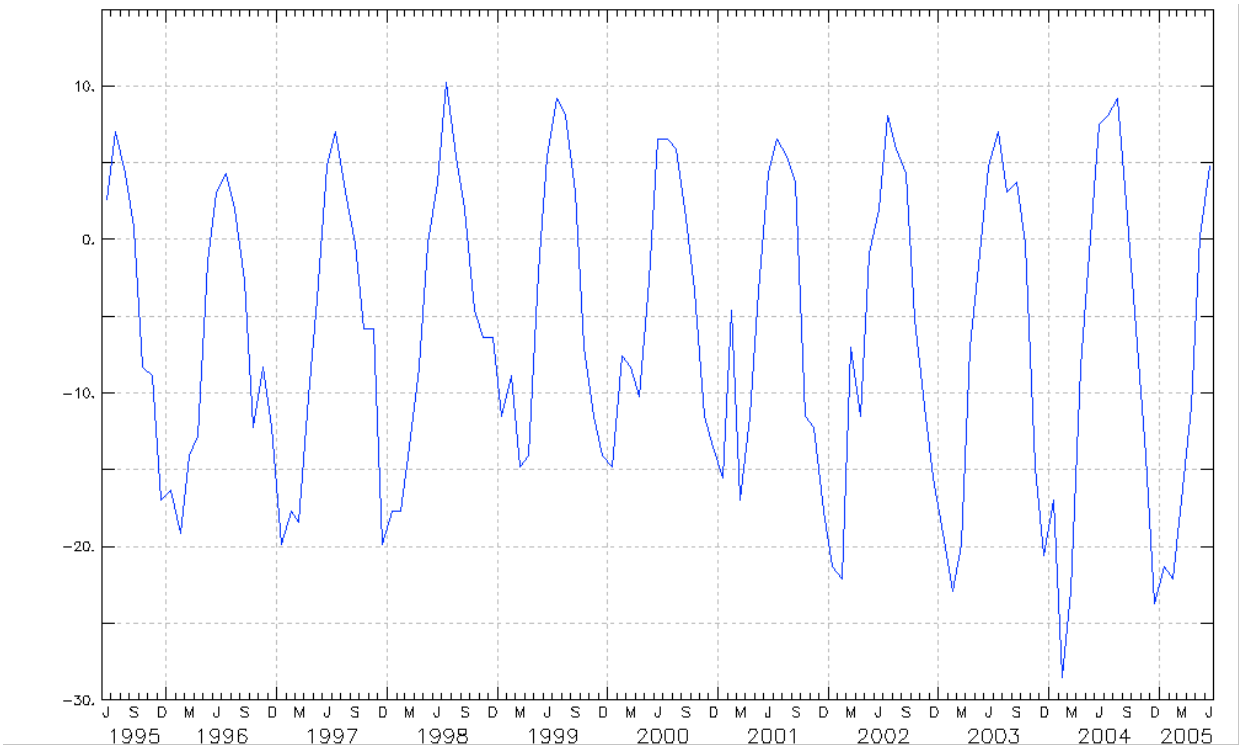
Line Plots Part 1 – Monthly Near Surface Air Temperature Time Series (June 1995 – June 2005) in degree C



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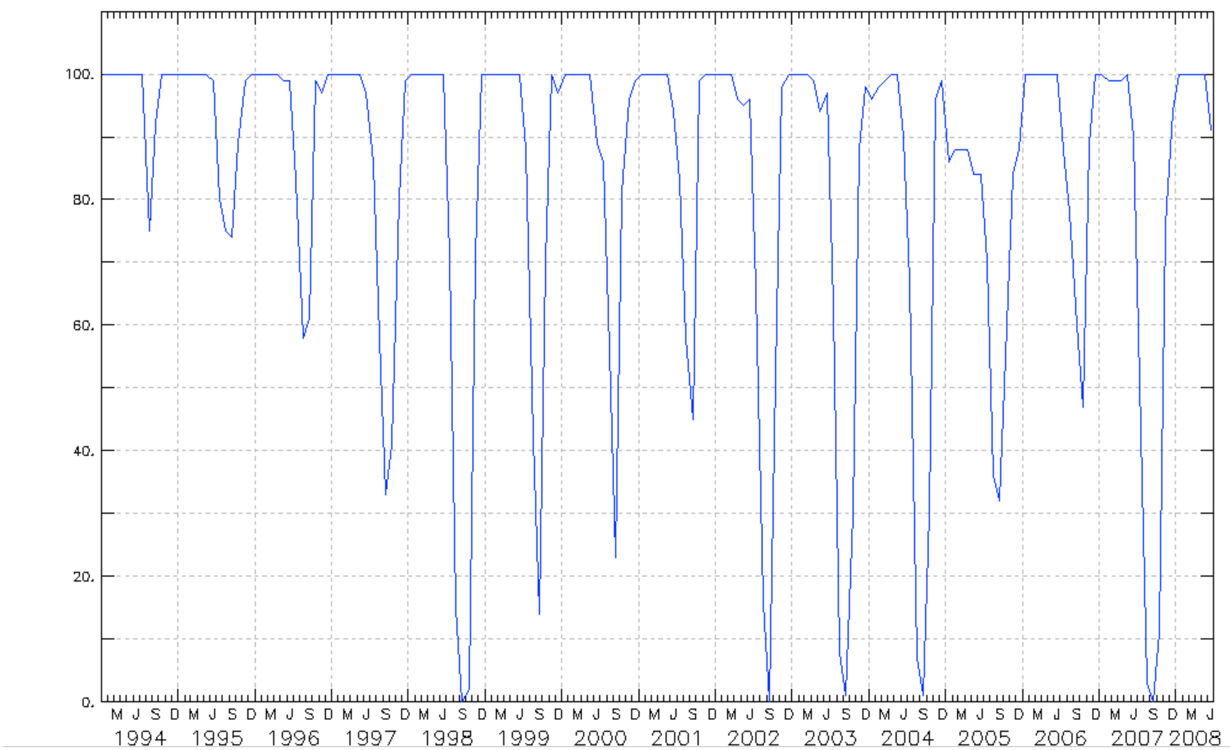
Line Plots Part 2 - Monthly Snow-Ice Percent Coverage Time Series (June 1995-June 2005) in percent



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Questions:

1. Which year is warmer in the South Beaufort Sea region, 1995 or 2005? How many degrees warmer?

2. Which year has more snow-ice amount in the same region? By how much?

3. Using the line plots, examine the seasonal oscillations of the variables. Do you see any trends in the line plots?

4. Write a paragraph describing your findings and conclusions using the data results.

5. Would you expect to see any impact on the habitat and migration of polar bears based on your conclusions?

6. How will the changes that you study affect the people of Northern Alaska and Western Canada? What other information or data would help you answer this question?

7. Do you think there is a global change trend or just a local random variation? Explain your answer. What other information or data would help you answer this question?

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Extensions:

1. Choose another animal species and consider the effects of climate change on their natural habitat and migration patterns.

2. Plan a migratory trip from the viewpoint of a polar bear. For example: Where (location) does your polar bear character begin and end the journey? Describe what your polar bear character experiences along the journey. For additional information, use the Polar Bear International website and Global Warming and Polar Bears links in the Lesson Links section.

Lesson plan contributed by Venugopal Bhat, Seattle, Washington